

Broadband Active Segmented Aperture and Radial Shear Nulling (VNC)

Completed Technology Project (2017 - 2018)



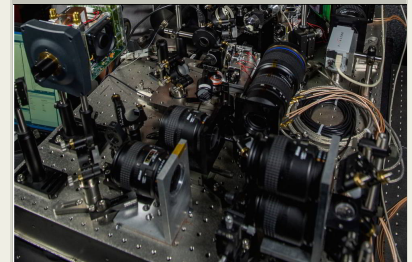
Project Introduction

The Visible Nulling Coronagraph (VNC) is a starlight suppression system for enabling exoplanet detection and atmospheric measurement. Conceptual space telescope missions including the large UV/optical/IR (LUVOIR) surveyor require such a starlight suppression system to carry out the scientific goals associated with directly imaging nearby worlds. Direct imaging is complementary to upcoming missions like TESS, and should eventually enable access to the > 95% of habitable worlds outside of transit discovery space.

This IRAD supports near-term work to 1) fabricate and test symmetric broadband interferometric nulling optics; 2) demonstrate automated fine alignment of the Segmented Aperture Interferometric Nulling Testbed (SAINT) primary mirror; 3) quantify performance of the SAINT closed-loop fine pointing system; and 4) assemble, align and demonstrate a radial shear first order implementation of a system known as the Phase-Occultation Nulling Coronagraph (PONC).

Anticipated Benefits

The segmented aperture and pointing system components of this work are motivated to test the VNC as a high-contrast imaging approach that functions with arbitrary telescope apertures. Future space telescopes will likely leverage the significant investment developing segmented mirror technology in order to improve telescope resolution and sensitivity while working within the confines of launch vehicle limitations. If we are successful with our demonstration, then this expertise in interferometry, and more specifically, interferometric nulling coronagraphy can be leveraged to motivate the development of increasingly larger arrays of segmented telescopes beyond JWST, and the LUVOIR concept.



Visible Nulling Coronagraph

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

Megan E Eckart
Timothy D Beach

Principal Investigator:

Patricia T Boyd

Co-Investigators:

Brian A Hicks
Teresa B Sheets
Tyler D Groff

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.2 Observatories

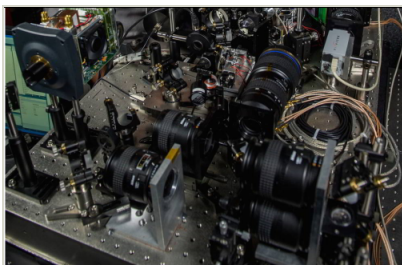
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Images



Visible Nulling Coronagraph

Visible Nulling Coronagraph

(<https://techport.nasa.gov/image/28482>)

Links

Innovative Planet-Finding Technology Passes Another Hurdle

(<https://www.nasa.gov/feature/goddard/innovative-planet-finding-technology-passes-another-hurdle>)

Visible Nulling Coronagraph Technology Maturation: High Contrast Imaging and Characterization of Exoplanets

(<https://exoplanets.nasa.gov/exep/technology/2009tdemabstractClampin/>)

Project Website:

<https://exoplanets.nasa.gov/exep/technology/TDEM-awards/>

Technology Areas (cont.)

└ TX08.2.1 Mirror Systems

Target Destination Outside the Solar System

Supported Mission Type Projected Mission (Pull)